Year 7
Year 8
Year 9

Key Stage 3 Learning Journey

		Big Idea						
1	Physics	Forces	**Forces: Speed** to define speed, and measure it using the equation speed = distance divided by time to draw, and analyse distance time graphs to describe a journey to start defining scientific questions in a practical situation. to describe the concept of relative motion. to represent forces using arrows	**Forces: Gravity:** to describe contact and non contact forces including gravity. to explain the difference between mass and weight to work out values of weight and gravity on other planets	**Forces:** - Analyse situations to identify the various forces that are acting, including equilibrium, friction and drag - Investigate forces involved in compressing and stretching materials, and springs.	**Forces/pressure:** Explain how pressure can be applied on a solid surface, and be able to calculate it. - Describe how pressure acts in a liquid, and gases. - Explain pressure changes in relation to particles and gravity. - Explain why some objects float and others sink. - Relate floating and sinking to density, displacement and upthrust - Explain the implications of these ideas.		
2	Physics	Electromagnets	**Electromagnets:** - Describe and draw circuit diagrams. - Describe what the terms mean, and how the current flows in different circuits. - Recognise the generation, and effects of static charge. - Explain how static charge can be generated.	**Voltage/resistance:** Describe what the terms mean, and how the voltage, current and resistance are related in different circuits. - Understand the differences between a series and a parallel circuit, including how they work in homes	**Magnetism:** - Know the laws of magnetic attraction. - Explain how a magnetic field can be represented by field lines, and the shape of fields around combinations of magnets. - Describe key features of the Earth's magnetic field.	**Electromagnets:** - Describe what an electromagnet is. - Investigate the factors affecting the strength of electromagnets. - Describe different applications of electromagnets.	**Current, potential difference and resistance** Describe and use the equations for charge. use equation V= IxR to calculate each factor describe how to investigate ohmic conductors Investigate and draw VC graphs for various components in circuits	
3	Physics	Energy	**Energy: Costs** - Explain that fuels are energy stores and that the amount stored can be measured. - Explain that energy can be neither created nor destroyed. - Describe the information a typical fuel bill provides, including units. - Describe ways of generating electricity, including advantages and disadvantages. - Critique claims made for the running costs of fluorescent light bulbs. - Evaluate actions that could be taken in response to rising energy demand.	**Energy: transfers** Describe energy stores and transfers. - Recognise what energy is and its unit. - Describe a range of energy transfers using simple diagrams, including falling objects. - Use a Sankey diagram as a model to represent simple energy changes. - Describe different situations that use the energy stored in compressing and stretching elastic materials, and how it is transferred.	**Energy: Work done** - Recognise situations where work is done. Be able to calculate work done in everyday situations. Describe the relationship work done = force x distance. - Apply the equation for work done to different situations. - Understand what simple machines are, and why they are useful. - Compare and contrast different machines	**Energy: heating and cooling:** - Describe how temperature differences lead to energy transfer. - Explain how heat can travel by conduction, convection and radiation, and give examples. - Explain the difference between conductors and insulators - Explain how insulation works and applications. - Describe the warming and cooling of objects.	**Energy stores and systems:** Describe, for common structures, the changes involved in the way energy is stored when a system changes. Calculate how energy is redistributed in a system when it changes. gravitational energy, kinetic energy, gravitational effects Describe how Work is done when charge flows in a circuit power specific heat capacity	**Conservation and dissipation of energy** Describe how Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed. Total energy is conserved Describe how only part of the energy is usefully transferred. The rest of the energy is dissipated. Describe thermal conductivity in the home. Describe and calculate efficiency.	**National and global energy:** Describe the main energy resources available for use on Earth. Distinguish between energy resources that are renewable and those that are non-renewable. Compare the ways that different energy resources are used, including transport, electricity generation and heating. Describe reliability of resources
4	Physics	Waves	**Waves:** - Identify how sounds are made, and that they transfer energy. - Understand frequency, wavelength and amplitude, and see them on an oscilloscope. - Explain what is meant by audible range. - Understand how the ear detects sounds, and ear defects. - Recognise how the speed of sound changes in different substances. - Analyse the effect of different materials on sound waves. - Use ideas about energy transfer to explain how soundproofing works.	**Waves: Light** - Describe how light passes through different materials. - Explain how shadows are formed in eclipses. - Describe how a mirror reflects light, and the difference between specular and diffuse reflection. - Apply the law of reflection. - Describe how light is refracted when it enters a different medium, and that it changes direction, and how this is used in lenses. - Describing how the human eye works. - Describe how a spectrum can be produced from white light. - Compare the properties of light at different frequencies.	**Wave effects:** - Understand how sound waves vary in frequency. - Apply ideas about frequency to understand ultrasound. - Understand practical applications of ultrasound. - Understand the function of microphones and loudspeakers. - Understand how audio equipment responds to different frequencies.	**Wave Properties:** - Understanding light can vary in frequency. - Describe UV light and its risks. - Explain the uses of UV light - Use water waves to model wave behaviour. - Understand and apply the processes of reflection and absorption. - Understanding longitudinal waves. - Understanding transverse waves. - Comparing types of wave.			
5	Chemistry	Matter	**The Particle Model** Identify solids, liquids and gases from the particle model. - Explain some properties of solids, liquids and gases using the particle model. - Define and describe the process of diffusion - Explain changes of state using the particle model.	**Separating mixtures** Describe the process of filtration. - Explain dissolving in terms of particles. - Describe and explain the distillation. - Describe and explain chromatography.	**Periodic Table** - Describe how the periodic table is organised and explain why it is useful. - Describe physical and Chemical properties of group 1. - Describe Physical and Chemical Properties of group 7. - Explain patterns in reactions using the periodic table.	**Elements** - Identify the three sub atomic particles and their charges and relative mass - Explain the differences between atoms, elements and compounds in terms of particles. - Compare the properties of elements and compounds. - Explain how properties of polymers relate to their function. - Explain how properties of ceramics relate to their function.	**The atom, symbols, relative atomic mass, electronic charge and isotopes** - Apply the use of chemical formula to balance equations. - Select and compare separation techniques chromatography, distillation. - Apply knowledge of physical processes to explain crystallisation. - Describe the main features of the plum pudding/nuclear and atomic models and describe the alpha scattering experiment - Explain how to use the periodic table to calculate protons, neutrons and electrons in an atom and apply this to isotopes. - Explain how you can use the periodic table to work out the electronic structures of atoms and how these can be represented. - Represent group 1 and group 7 reactions with balanced	**The periodic table** - Explain how the periodic table is organised in terms of electronic structure. - Apply knowledge of the periodic table to predict some reactions of elements. - Explain how the chemical properties of an elements relates to its electronic structure and therefore position in the periodic table. - Describe and evaluate developments in the formation of the periodic table. - Explain how properties of the elements in Group 0 depend on the outer shell of electrons of the atoms. - Describe and explain reactions of group 1 and group 7 elements and the compounds they form and apply electronic structure to this. - Represent group 1 and group 7 reactions with balanced
6	Chemistry	Reactions	**Metals and Non Metals** - Describe the physical properties of metals and non metals. - Describe the reaction between metals and acids using particle diagrams and word equations. - Explain displacement reactions using the idea of reactivity and word equations. - Recall examples of oxidation reactions and describe them using particle diagrams and word equations.	**Acids and alkalis** Describe what acids and alkalis are. - Recall examples of acids and alkalis. - Describe how to use indicators and the pH scale to identify different acids and alkalis. - Describe what the pH scale measures. - Recall and apply the neutralisation equation. - Use the pH scale to explain neutralisation.	**Chemical energy** - Explain energy changes taking place during exothermic reactions. - Describe examples of exothermic and endothermic reactions. - State what a catalyst is and explain how it works in terms of energy.	**Types of reactions** - Use a formula to explain combustion. - Explain chemical changes using the particle model. - Explain uses of combustion in the wider world. - Explain thermal decomposition reactions using particles and formulas describe some uses of this reaction. - Explain oxidation using symbol equations and the particle model.	**Chemical bonds, ionic, covalent and metallic** - Explain chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons in ionic, covalent and metallic bonding. - Use dot and cross diagrams and other molecular notation to represent bonding in ionic and covalent substances. - Describe the bonding in metals and represent this in diagram form. - Evaluate the usefulness of some models of ionic, covalent and metallic bonding including 2D models of 3D objects.	**How bonding and structure are related to the properties of substances** - Predict the states of substances at different temperatures given appropriate data. - Explain the different temperatures at which changes of state occur in terms of energy transfers and types of bonding. - Include appropriate state symbols in chemical equations for the reactions in this specification. - Describe the structure of giant ionic lattices and general properties of these materials. - Explain the properties of giant ionic lattices and use the state symbols e.l./g.a/s to facilitate this. - Use the idea that intermolecular forces are weak compared with covalent bonds to explain the bulk properties of molecular substances.
7	Chemistry	Earth	**Earth structure** Exercise the composition and structure of the Earth. - Describe the properties of metamorphic, igneous and sedimentary rocks and explain how they are formed. - Explain the stages of the rock cycle. - Explain how fossils are formed and how they can give evidence about the past.	**The Universe** - Describe the characteristics of stars and our own sun as one of them and explain the concept of galaxies and our own galaxy as one of them. - Describe night, day and the seasons and the phases of the moon and explain these in terms of the motion of the Earth and other celestial bodies. - Recall the definition of a light year and explain why it is used in astronomy. - Describe the use of models of our solar system and other and evaluate their effectiveness.	**Climate** - Describe the composition of the modern atmosphere the ancient atmosphere and explain why it has changed over time. - Describe the carbon cycle and explain the effects that humans have had on the carbon cycle. - Describe the carbon cycle and explain the effects that humans have had on the carbon cycle. - Explain the consequences of global warming for living things.	**Earth's resources** - Describe some of the resources that the Earth provides and explain how human activity can limit these resources. - Describe the process of recycling and explain some advantages and disadvantages of these processes. - Describe what an ore is and how more reactive metals and less reactive metals can be extracted from their ores.	**Properties of transition metals** - Compare the physical and chemical properties of group 1 with transition metals with reference to Cr, Mn, Fe, Co, Ni, Cu. - Explain the links between properties of transition metals with their common uses. - Describe how to carry out flame tests and recognise some common metals from these tests.		
8	Biology	Organisms	**Movement** - identify bones of the human skeleton and explain how the properties of bones contribute to skeleton functions. - identify different joints and describe the roles of tendons, ligaments and muscles in movement. - state the roles of antagonistic muscles in movement. - recall how some medical problems affect the skeleton and how they can be treated.	**Cells** - define the terms tissues, organs and organ systems and describe the consequences of recreational drug use and organ damage on body systems. - list scientific terminology relating to plant and animal cells and use it to describe and explain cell structure. - identify specialised cells and explain how their structures relate to their functions. - follow instructions to compare cells under a microscope. - recognise unicellular organisms and describe their adaptations.	**Breathing** - describe how pressure changes arise in the mechanisms of breathing. - identify simple methods to measure lung volume. - state the features of the human gas exchange system and explain how these features and breathing facilitate respiration.	**Digestion** - use developments in our understanding of smoking to describe and explain the effects of diseases and lifestyle on the human breathing system. - examine the roles of components of a healthy diet and compare the energy requirements of different groups of people. - describe the physical effects of eating an unbalanced diet in terms of over and under eating as well as dietary deficiencies. - use models to describe the process of digestion. - describe and explain the roles of organs and enzymes in the human digestive system.	**Cell structure** - compare eukaryotic and prokaryotic cells, using standard forms to perform order of magnitude size calculations. - relate the sizes and features of sub-cellular structures to their functions. - analyse features of specialised cells to explain their functions. - link cell differentiation to the growth, development and maintenance of an organism. - compare different types of microscopy and carry out magnification calculations for cells viewed under a light microscope. - use aseptic technique to culture microorganisms safely and use data to explain the effect of disinfectants and antibiotics on the size of their populations.	**Principles of organisation** - differentiate between the features of cells, tissues and organs to explain the organisation of multicellular organisms.
9	Biology	Ecosystems	**Interdependence** - recall the features of a food web and make predictions about the effects of changing plant and animal populations. - state the role of fungi in the environment and the effect that they have on food chains. - describe the role of insects in pollination and explain the importance of insects for world food security. - list different ways in which organisms affect their environment and explain the effect of predator-prey relationships on an ecosystem.	**Plant reproduction** - describe the functional parts of flowering plants and make comparisons between wind pollinated and insect pollinated specimens. - describe and explain the importance of pollination and fertilisation for seed formation. - make links between seed dispersal mechanisms and the variety seen in seed structures. - describe the role of fruit formation in seed dispersal and compare the outcomes with different seed dispersal mechanisms.	**Respiration** - explain the importance of respiration and interpret the chemical equation for the process. - use ideas about respiration to give examples of why aerobic and anaerobic respiration take place in the body during different sports and explain oxygen debt. - explain the production of carbon dioxide by plants and microbes in anaerobic respiration and recall the word equation for fermentation. - describe some useful applications of fermentation. - compare the differences between anaerobic and aerobic respiration.	**Photosynthesis** - utilise practical work to demonstrate that chlorophyll is essential for photosynthesis. - relate the size, cellular composition and structure of leaves to their role in photosynthesis. - explain how cell structures facilitate water and mineral movement in plants. - explain the effects of mineral deficiencies on plant growth. - interpret experimental data to identify factors that affect photosynthesis.	**Transport in cells** - explain the factors that affect the diffusion rate of chemicals into and out of cells, linking surface area to volume ratios to the different exchange surface requirements of some organisms. - describe the movement of water across cell membranes and use experimental data to explain water gain or loss by a cell. - differentiate between osmosis, active transport and diffusion and describe the conditions that facilitate each cellular transport process.	
10	Biology	Genes	**Variation** - define the term variation and differentiate between continuous and discontinuous variation. - identify inherited or environmentally determined features in offspring and use ideas about variation to explain differences in siblings. - use examples to describe and explain the importance of variation for the survival of a species.	**Human reproduction** - describe the functions of the female reproductive system and the process of menstruation, making links to fertility. - describe the structure and function of the male reproductive system and the process of fertilisation in humans. - recognise the stages of foetal development and describe the role of the mother's body in its growth. - describe factors that affect the development of a foetus. - apply knowledge about smoking and evaluate its effect during pregnancy.	**Evolution** - explain how competition is a driving factor in natural selection. - describe and explain the importance of biodiversity. - interpret theories about dinosaur extinction to identify changes that can cause a species to become extinct and explain the importance of gene banks.	**Inheritance** - assess the work of Watson, Crick, Wilkins and Franklin to describe the structure and location of DNA and explain the link with chromosomes and genes. - apply ideas about numbers of chromosomes in gametes and fertilised eggs to explain how some genetic disorders arise. - explain how inherited differences arise and the effect environment plays on variation using differences seen between siblings and identical twins as examples. - make predictions about the likelihood of offspring inheriting specific traits	**Cell division** - use the term chromosome accurately to explain where genetic material is located in a cell. - describe the stages of the cell cycle and explain the importance of mitosis in the growth and development of multicellular organisms. - explain the functions and applications of stem cells, evaluating different perspectives on their use in medicine and research.	